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Hanford and Radioactive Tumbleweeds: A Case Study

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ABSTRACT

Hanford facility is the most contaminated nuclear site in Washington. Since the cessation of plutonium production in 1987, it is also the site of the largest and most expensive environmental cleanup project in History. Without prior knowledge of the dangers associated with radioactive wastes, the DoE had disposed gallons of nuclear wastes directly into the soil and Columbia River. The presence of 'Russian thistle' has further aggravated the contamination problem at the facility's underground zones. The taproot of the 'invader species' grows as deep as 20 feet sucking up radio-nuclides such as strontium & cesium. Upon drying, its shoot breaks up and tumbles along with the wind spreading radioactivity in the process. Hence it garnered the name 'Radioactive Tumbleweeds'. Among 1100 documented findings of contaminated vegetation of the past 50 years in Hanford, 80% were radioactive tumbleweeds. Literature review has also revealed that these plants were capable of carrying as much as 66 mega Becquerel's of radioactivity. Mulching techniques and controlling the thistles from coming in contact with contaminated sites are potential mitigation measures for preventing possible radiation disasters.

Keywords : Hazardous, Radioactivity, Hanford, Plutonium

Introduction

The largest plutonium production project in the world occurred at the Hanford Facility (inset), a 560-square mile manufacturing plant located in southeast Washington. Built in 1943 for the top-secret Manhattan Project, Hanford's nine plutonium production reactors were deactivated between 1964 and 1971 because of decreasing demand for plutonium. The ninth, the 'N' reactor, operated alone after 1971, until it was placed on standby in 1988. The last reactor was shut down in 1986.



Study Area



There are three kinds of radioactive solid waste buried at Hanford: Transuranic, Low-level mixed waste & Transuranic mixed waste. The wastes were dumped directly into the soil permeating the groundwater and also over one-third of Hanford's storage tanks were leaking, adding to the flow of radionuclides into the groundwater. The effects of the Columbia River's contamination were not only devastating to the local community, but also impacted all who lived downstream (inset) and who depended on the river for their livelihood.

Research Problem

The U.S. Department of Energy has predicted that it would take until 2047 to treat all of Hanford's Nuclear Waste. The audit from the Energy department found that more than \$85 million was spent over the past 10-15 years to clean up groundwater. Though the Cold War has been long over, the Hanford Nuclear Reservation continues to battle radiations in the guise of Russian thistles.

Accidentally imported several years ago to the Dakotas, as it rolls down desert roads these plants disperse seeds typically numbering 250,000 per plant. "Tumbleweed," "Russian thistle" and "wind witch" are common names for this plant (inset). The weeds have roots that can stretch 15-20 feet deep in search of water, which at Hanford is likely to be contaminated. The plants usually grow 3-4 feet tall before they break off to scatter seeds as the wind blows around. This deep-rooted vegetation growing on or near contaminated waste sites can absorb radionuclides into their roots and transport them to surface (inset). Stray tumbleweeds have been contaminated with radioactivity after landing fleetingly in ponds of wastewater at nuclear facilities. Tumbleweeds



were also able to blow into wastewater ponds and wash up on shore and blow out again.

Control Measures

Once tumbleweeds enter radioactive zones, they are handled as radioactive waste. Using Geiger-Mueller counters (inset) when contaminated tumbleweeds are found, they are pitch forked by specially trained and clothed workers into a regulated garbage truck, compacted and disposed of at an on-site low-level waste dump. The DoE found 20 toxic tumbleweeds in the first six months of 1998, compared



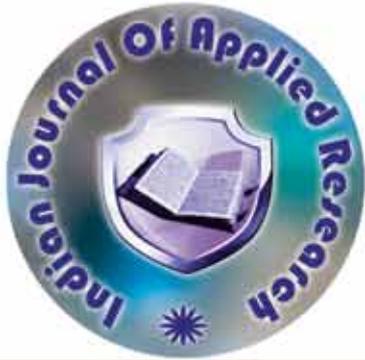
with 11 during all of 1995, 19 in 1996 and 39 in 1997. The Hanford Integrated Biological Control program was established in 1999 to control the growth of deep-rooted vegetation over contaminated and potentially contaminated waste sites. Mulching is a routine activity practiced to check tumbleweeds from accumulating and blowing into radioactive zones.

Conclusion

The Hanford Nuclear Reservation is the largest nuclear waste dump in the Western Hemisphere and a major northwest environmental issue. Hanford's operations discharged over 440 billion gallons of contaminated liquids into the ground, resulting in approximately 200 square miles of contaminated groundwater beneath Hanford. Russian thistle, a non-native species, has been a common problem at the underground sites since their taproots reached down as far as 20 feet sucking up radionuclide and spreading them miles away. Once so, the contaminants attain a lost status. The Techniques to contain radioactivity hence may envisage controlling the thistles from coming in contact with contaminated sites.

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